ecbi policy report

Mitigation:
What's in it for Africa?

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Table of Contents

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Executive Summary

This briefing was initially prepared in advance of the European Capacity Building Initiative (ecbi) workshops for Francophone and Anglophone Africa which were held respectively in Dakar, Senegal (21 to 23 July 2009) and Addis Ababa, Ethiopia (18 to 20 August 2009). It was later updated to reflect feedback from the above workshops.

Climate change is real and its impacts are being observed around the world. These impacts are aready vivid in Africa and will be even more intense on the continent than other regions with many African countries suffering from the impacts of extreme weather events such as droughts, heat waves and floods with greater frequency and intensity. This combination of higher vulnerability and lower adaptive capacity could threaten past development gains and constrain future economic progress and development particularly for many Least Developed Countries (LDCs) in Africa, which are not driving the problem in any way.

Emissions of long-lived green house gases (GHG) ultimately will have the same climate impact regardless of the source. Based on their historical responsibility on global warming so far, Annex I countries must commit to much more stringent emission reductions targets. However, mitigation actions would ultimately be required of non-Annex I countries as well if global warming is to be constrained to well below 2°C above pre-industrial levels. In order to participate in such mitigation actions, non-Annex I countries must be supported with measurable, reportable and verifiable means of implemention (Finance, technology transfer and capacity building). Global warming is virtually certain to exceed 2°C under the current reduction proposals by Parties for 2020 and 2050.

Ambitious emission reduction scenario with reasonable global costs will likely keep global warming well below 2°C. Physical laws are not yet prohibitive and much may be gained by increasing political and social "will" of developed countries to support a greener developemnt pathway in developing countries through deployment of cleaner technologies, finance and capacity building. This would translate into massive changes to the world's carbon-based economy and the current inefficient use of energy.The good news is that many of the required technologies, such as geothermal, solar and wind power already exist, and there are many opportunities to improve and expand on their use.

Africa has a huge clean energy potential. An effective response to climate change for the continent should therefore focus on adaptation as well as mobilizing financing and technology transfer to seize mitigation opportunities that may allow African countries to make a real and serious transformative step forward by tapping into its abundant renewable energy potential and avoid some of the mistakes made by other countries in their development process.

A number of strategies are proposed to ensure Africa seizes the opportunity and ensures an effective, fair and inclusive new regime after Copenhagen. Ensuring mid-term and long-term aggressive, binding emission reduction targets by developed countries will be paramount. Also, it will be important to ensure sustained and predictable finance for clean energy projects in Africa that also have adaptation benefits. This will also entail

overhauling the Carbon Market structure to take into account special needs of Africa and the barriers that have already been identified.

1. Introduction: The geopolitics of climate change - 2°C lottery

It is now clear from observations of 20th century warming and impacts, that climate change is happening and is transforming the world as we know it. According to the Fourth Assessment Report (AR4)[1] of the International Panel on Climate Change (IPCC), warming of the climate system is unequivocal. As in the rest of the world, near-surface temperatures over Africa have increased at a rate that cannot be explained by natural causes (see Figure 1)

Observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases. From a sample of 75 studies, that show significant change in many physical systems (snow, ice and frozen ground; hydrology; and coastal processes) as well as biological systems (terrestrial, marine and freshwater biological systems), including more than 29,000 observational data series, 89% happen to be consistent with the direction of change expected as a response to warming.

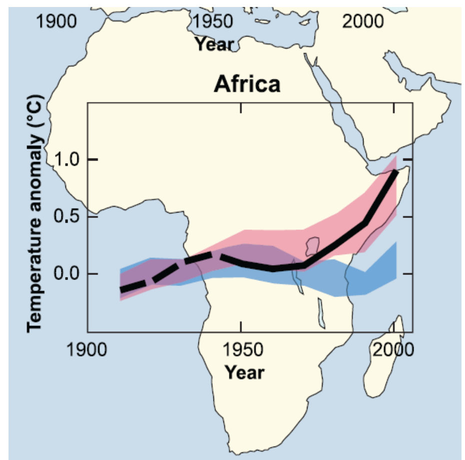


Figure 1: Mean temperature over Africa (observations black curve, modelled pink shaded area) has increased faster over the 20th Century than can be explained by natural variations (modelled blue shaded area). (source: IPCC AR4 SYR Summary for Policy Makers)

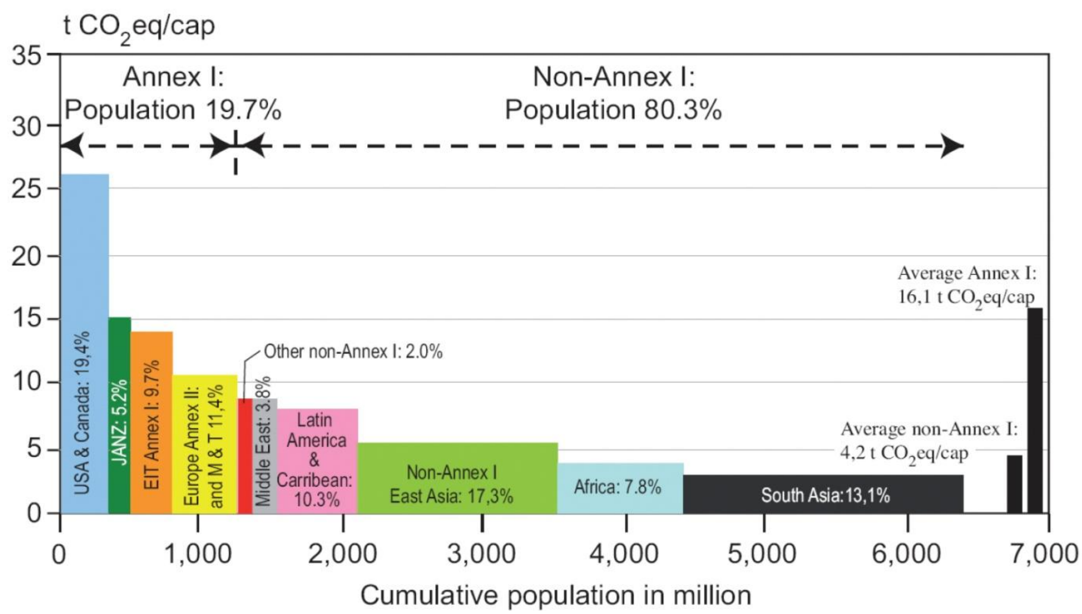
The IPCC Special Report on Emissions Scenarios (SRES, 2000) projects an increase of global greenhouse gas (GHG) emissions by 25% to 90% CO_2 equivalent (CO_2-eq) between 2000 and 2030. More recent scenarios without additional emissions mitigation are comparable in range (IPCC AR4 SYR SPM). Under these scenarios, or if the current levels of GHG emissions are maintained at or exceed current rates, this would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century.

According to the IPCC AR4 report, climate change is likely to increase the risk of severe flooding and droughts in many regions. This could, in turn, devastate many countries' food production, lead to the spread of various diseases, and cause hundreds of thousands of deaths per year, particularly for those living in the developing world. Pascual (2008)[2] reports that nearly two billion people were affected by climate related disasters in the 1990s and that rate may double in the next decade.

Avoiding the impacts from climate change arising from the emissions of GHG is one of the most complex challenges that we, as the collective human race, have ever created for ourselves. Pascual (2008) asserts that the difficulties lie in the intersection of earth sciences, technology, economics and politics. The emissions of long-lived GHG ultimately will have the same climate impact regardless of where they are emitted from.

Hence it is impossible to solve the global problem without involving all contributing countries.

Historically, the responsibility for climate change lies with the industrialised world. By 2000, the countries within the Annex I group (comprising 19.7% of the global population) had contributed roughly 50% of global temperature increase since pre-industrial times[3]. As shown in figure 2, annex I parties emissions per capita are roughly four times as much as those from non-Annex I. Emerging market economies, like Brazil, China, India and South Africa, that contribute considerably to current emissions, but have done less so historically, will have to play a role in undertaking nationally appropriate



mitigation action. For this to happen, however, developed countries will have to commit for support with measurable, reportable and verifiable finance, technology transfer and capacity building. The biggest catastrophic impacts, however, will be on Least Developed countries (LDCs) that are not driving the problem in any way.

Figure 2: Year 2004 distribution of regional per capita GHG emissions (all Kyoto gases, including those from land-use) over the population of different country groupings. The percentages in the bars indicate a regions share in global GHG emissions. From: IPCC AR4 WG3 Summary for Policy Makers.

Scientific assessments have repeatedly shown that the African continent is most likely to be hit the hardest. There is still a great deal about climate change in Africa that we do not know[4]; in general, the best assumption is that many regions of Africa will suffer from droughts and floods with greater frequency and intensity. Specifically:

- The drier sub-tropical regions will warm more than the moister tropics in general.
- Northern and southern Africa will become much hotter (as much as 4-6°C) and drier in the summer, with a much greater risk of drought.
- Wheat production in the north and maize production in the south will be adversely affected.
- In eastern Africa, including the Horn of Africa, and parts of central and western

Africa average rainfall will increase.

- As a result, vector borne diseases such as malaria and dengue fever may spread and become more severe.
- Sea levels will rise, with serious consequences in the Nile Delta and certain parts of West Africa, as well as the marine productive and tourist areas of coral reefs in East and South-East Africa.

At which level of global-mean temperature can we expect which impacts?

Figure 3 summarizes some of the expected impacts under different levels of global-mean temperature increase. Especially important are the estimated decreases in surface-water availability and associated decreases in water security and agricultural yields.

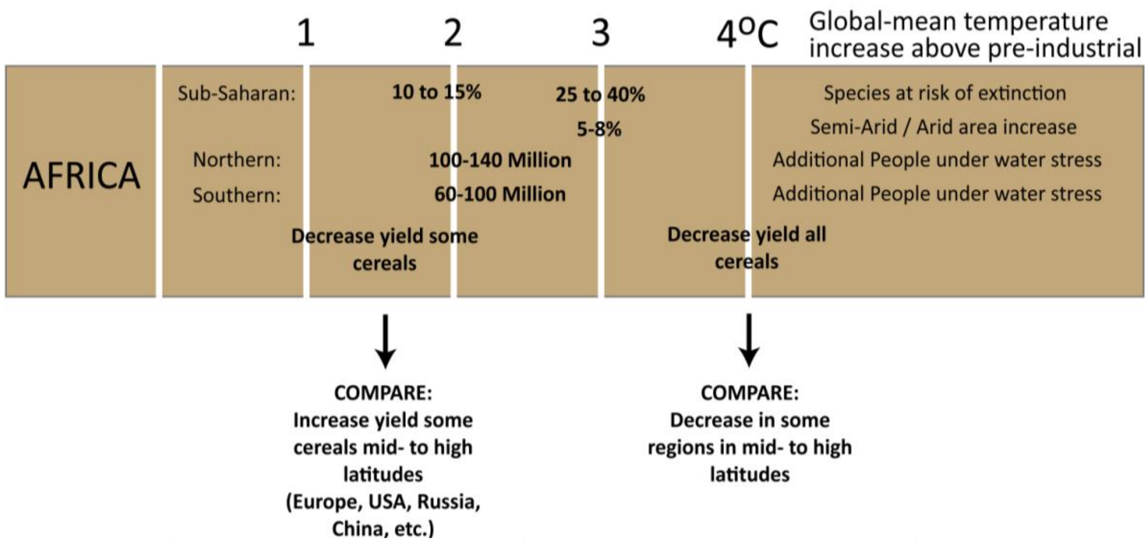


Figure 3: Summary of expected impacts in Africa as a result of global-mean temperature increase. (adapted from IPCC AR4 Synthesis Report Summary for Policy Makers).

As in many other regions around the world, impacts are estimated to increase strongly in Africa when global warming exceeds 2°C. However, considerable impacts are occurring even today.

How should the international community respond to these sobering facts?

The obvious response is to reduce GHG emissions on a global scale and simultaneously adapt to the unavoidable remaining climate change. Some countries have called for limiting emissions to keep global GHG concentrations below 450 parts per million (ppm) CO_2-eq. Statements from more than 100 countries support the goal that warming be limited to a 2°C increase above pre-industrial levels, or lower. Others such as the Alliance of Small Island States (AOSIS) and the group of LDCs advocate for a stabilization of atmospheric CO_2 at 350 (ppm) or 1.5°C temperature target. What do all these goals add up to? What negotiating strategy should African countries (and in particular the LDCs) adopt in order to get the desired outcome from the climate change conference in Copenhagen in December 2009?

This briefing paper attempts to address these issues based on the IPCC AR4 and the latest, state-of-the-art scientific reports. Its scope will be limited to mitigation commitments by developed countries and mitigation actions by developing countries. Other aspects of enhanced action on mitigation covered by the Bali Action Plan (e.g REDD, sectoral approaches, market-based approaches, economic and social consequences of responses measures) are outside the scope of this paper. ***Section 2*** will look at the various GHG stabilization targets (350/450/550 ppm) and their relevance in limiting global warming to 2°C increase above pre-industrial levels, or lower. It will also look at what is physically possible from a scientific perspective. ***Section 3*** will attempt to resolve the adaptation-mitigation equation as a way of responding to the challenge. The section will explore the interrelationships and synergies that exist between adaptation and mitigation. ***Section 4*** will analyze the various options on the table from Annex I Parties to see if they can guarantee a "safe landing". In so doing, we will critically analyze individual proposals from both Annex I and non-Annex I, and figure out what they actually mean in terms of their share of mitigation effort and level of ambition. Finally, ***section 5*** will discuss the policy issues for African negotiators for consideration in the lead-up to Copenhagen.

2. The challenge – keeping GHG concentrations below dangerous levels

Keeping GHG concentration within a range that could be considered safe is tougher than previously thought. In the IPCC's AR4 synthesis report, the mitigation stabilization scenarios in Category I (445 to 490 ppm CO_2-eq) are shown to reach a global temperature level of between 2 to 2.4°C above pre-industrial. However, as AR4 shows, the link between stabilization levels and temperature is uncertain. Figure 4 shows the ***probability*** that a temperature target is ***exceeded*** for concentration targets between 350 and 550 ppm CO_2- eq. This data shows that the probability that 2°C is exceeded is roughly 60% at a GHG concentration target of 450 ppm. Perhaps more worrying is that the chance to exceed the much more dangerous 3°C level is about 15%, which is equal to a chance of one in six. If the concentration target is lowered to 400 ppm CO_2-eq, the probability that 2°C is exceeded reduces to a 1 in 5 chance and exceeding 3°C becomes very unlikely at a chance of less than 5%. To reach this probability range for a 1.5°C target, the concentration needs to be reduced further to a value closer to 350 ppm CO_2-eq. This is one reason why Hansen et al (2008)[5] advise a 350 ppm concentration target.

Although the link between concentrations and temperature increase introduces additional uncertainties related to climate system response, it should be emphasized that a temperature target is more directly related to impacts and hence much more relevant to policy makers than an indicator on concentrations. The former includes the climate system's response to emissions and concentration changes

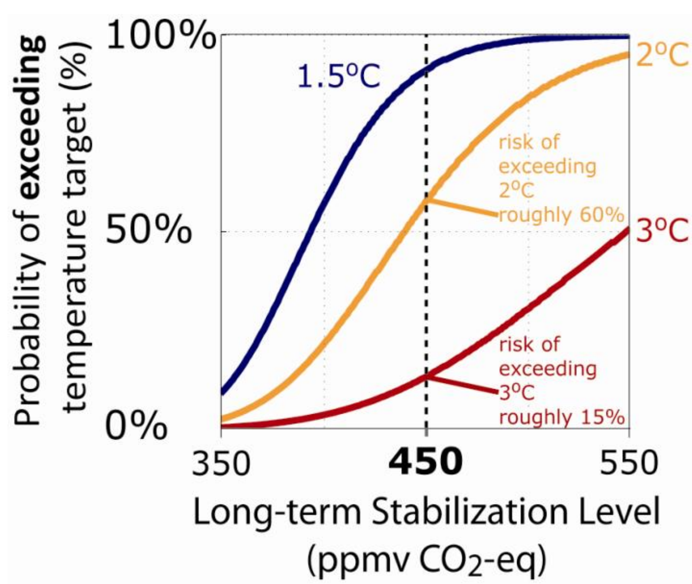


Figure 4: The probability that temperature targets are exceeded for different levels of long-term stabilization of GHG concentrations.

whereas the latter form an intermediate driver of climate change between emissions and temperature increase. Hence, uncertainty about climate system response should not be a reason to limit one's perspective of concentrations. On the contrary, uncertainty about the climate system's response should form an integrated part of a full risk assessment.

So, can we realistically stay well below 2°C?

The answer to this pertinent question depends very much on the lenses through which one analyses the issue. ***Firstly***, even if all global emissions were to stop in a few years from now, the climate needs several centuries to reach a new equilibrium with past emissions. So, physical laws limit the rate of a decrease in temperature: this is inescapable "inertia by physical laws". ***Secondly***, an example of an ambitious emission reduction scenario with reasonable global costs[6] will likely keep global warming below 2°C. This includes both the "physical inertia" and the "inertia by limits to technical and economical potential". ***Finally***, in a "business-as-usual" scenario without any mitigation, global warming will likely exceed 3°C by the end of the century and will still be rising. We call this "inertia caused by limited political and social will". The gap between this and the second case is ultimately caused by lack of political and social commitment. These scenarios suggest that we can stay below 2°C. Physical laws are not yet prohibitive and much may be gained by increasing political and social "will".

According to Monastersky[7], the difference between the 450ppm and 350ppm stabilization levels is not just one of scale. It is a question of fundamental direction. A CO_2 concentration of 450 ppm awaits the world at some point in the future, but might conceivably be averted, though with difficulty. However, given that the concentration of CO_2 alone has recently exceeded 380 ppm, a 350 ppm target can be seen only in the rearview mirror i.e. the world would need not only to stop emitting but to reverse course. Hansen et al (2008) argue "when you say 450 or 550, you're talking about what rates of growth you are going to allow. When you say we have to get to 350 that means you have to phase down CO_2 emissions in the next few decades." Because of the slow response of the global climate system, it may be difficult to cool the climate down from any eventual peak or plateau, no matter what CO_2 concentration is chosen as a target by the international community. Since a large part of CO_2 emissions remains in the atmosphere for centuries to millennia, any stabilization level, low or high, ultimately requires global CO_2 emissions to be brought down to near-zero in the long term, while negative emissions (net CO_2 uptake) are required in order to bring the CO_2 concentration down to below 400 ppm. The latter may be achieved by carbon capture and storage, in combination with net CO_2 uptake by biofuel energy systems, or 'direct air capture' involving chemical processes.

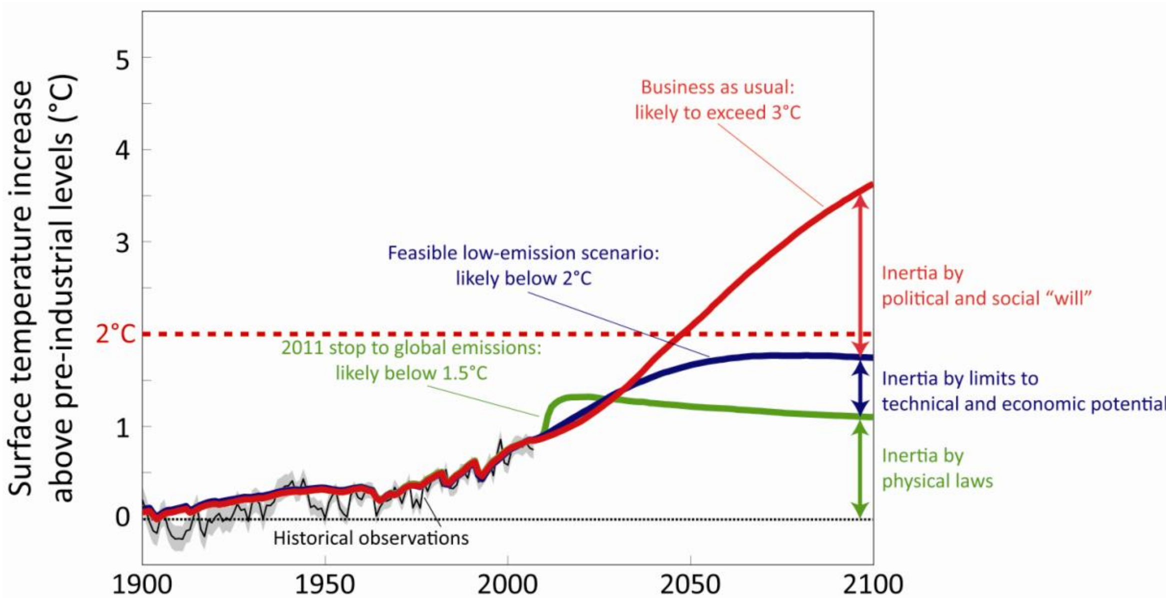


Figure 5: Illustration of the factors that limit the speed by which the world could "change course" on its way to limiting global warming to "safe" levels. Inertia by physical laws causes temperature to decrease only slowly, even when all emissions globally would be cut completely (green). An ambitious scenario of global emission reductions that are technically and economically feasible will limit global warming to below 2°C (blue; scenario from van Vuuren et al. 2008[6]). A business as usual scenario will lead to exceeding 3°C before the year 2100 and possibly 4°C post-2100 (red; IPCC SRES scenario A1B). The difference between the blue feasible low-emissions scenario and the red business-as-usual pathway can be interpreted as the benefit of increasing political and social "will" to mitigate (red arrow).

By looking at the problem from a different perspective i.e. tallying the total amount of carbon injected into the atmosphere across human history, a paper by Meinshausen et al (2009)[8] published in Nature reveals how close the world has come to a tipping point. The paper asserts that the maximum temperature the Earth will experience by the year 2100 depends most reliably on the total amount of CO_2 emitted by 2050, rather than on the final stabilization concentration. The base-case estimate is that total cumulative CO_2 emissions from today (2009) to 2050 ('carbon budget') need to stay below 190GtC for us to have a good chance (75%) of staying below 2°C.

On one hand, if we put aside the 'climate debt' and allocate this remaining carbon budget (190 GtC) on a per capita basis, the carbon allowance for Annex I of 38 GtC would be exhausted around 2020 at the current level of CO_2 emissions. However, as argued in section 1, Annex I already bears a heavy historical responsibility vis-à-vis global warming so far. Allocating the remaining carbon budget from now to 2050 onwards on a per capita basis alone would not be equitable, and should be seen as the most generous proposition possible in favor of Annex I Parties. On the other hand, if Annex I would cut all emissions to zero immediately this would leave non- Annex I with a carbon allowance of 190 GtC, which would be exhausted by 2040 at the current level of emissions. So, although Annex I 'owes' a climate debt to non Annex I, supported nationally appropriate mitigation actions ultimately would be required of non Annex I as well for a 2°C target.

The probability to stay below 2°C drops below 50% if we emit more than 310 GtC between now and 2050. This is significantly less than the amount of carbon contained in proven reserves of gas, oil, coal, let alone reserves of non-traditional fossil fuel sources such as tar, or oil sands and methane hydrates. Last year, global emissions were more than 9GtC, and these have been increasing at around 1-3% a year. At that rate, global emissions will reach 190 GtC in 20 years.

3. Rising to the challenge: adaption-mitigation equation

Although we tend to observe growing diversification of tasks on adaptation and mitigation, there exist some interrelationships and synergies between the two. Local mitigation strategies, such as the use of energy efficient stoves in rural areas in Africa, can also have some co-benefits. For example, they enable families to cut down on time spent collecting firewood, indoor air pollution is reduced, and cooking becomes much easier.

Parry et al (2009)[9] suggest the timing and stringency of emission reductions would sway the scale of potential damage, which would affect how much adaptation is needed: "slower and lower reductions would lead to larger effects. Thus if we wish to adapt to 90% of the risk implied by delaying mitigative action until 2035, we should be planning to adapt to at least 4°C of warming".

Mitigation is crucial, but a certain level of climate change is already 'hard wired' into the system meaning that some impacts will be inevitable even if all greenhouse gas emissions were halted. This would increase the residual damage - the impacts that happen despite the existing impact reduction measures by mitigation and adaptation combined. Additionally, there are some impacts of climate change that are beyond adaptation. Take for example damage to irreplaceable biological systems such as coral reefs or the cost of continuing to irrigate for farming in drying regions. The diagram in Figure 6 illustrates the relationships between adaptation, mitigation and the residual damage. This residue increases if mitigation is less ambitious, since that would lead to adaptation options being overstretched, or exhausted.

According to Parry et al (2009) "urgent and major emissions reductions are essential to avoid the most severe effects. Yet even the most prompt and stringent actions still risk overshooting a target of 2°C and it will require centuries to achieve a roughly stable climate with tolerable low amounts of warming". Schmidt et al (2009)[10] suggest that: "unless emissions begin declining very soon, severe disruptions to the climate system will require expensive adaptation measures and may eventually require cleaning up the mess by actively removing CO_2 from the atmosphere. Like an oil spill or ground water contamination, it will probably be cheaper in the long run to avoid making the mess in the first place."

In the following sections, we review the commitments to reducing GHG emissions from developed and developing countries and calculate what they add up to in terms of GHG emissions, their implications for the global climate system and how they compare to the goal of constraining global warming to 1.5°C, or 2°C above pre-industrial levels.

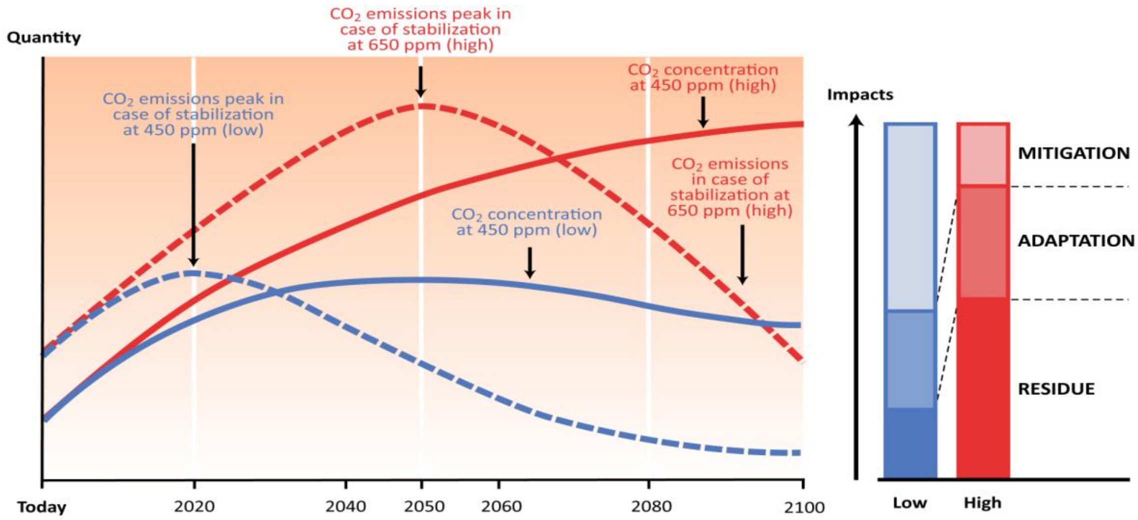


Figure 6: Illustration of the tradeoff between mitigation and adaptation. If emissions peak late (red dashed line) concentration continues to rise (red full line). This leads to a heavy burden on adaptive capacity, leaving a larger part of impacts and damages as "residue" that cannot be absorbed by adaptation efforts. Earlier and more ambitious mitigation (blue) diminishes this residue. Source: Metz and Riahi (2007, personal communication).

4. What's on the negotiating table?

In order to limit global warming to 2°C, developed countries would need to cut their emissions between 25% and 40% below 1990 levels by 2020 and between 50%-80% below 1990 levels by 2050, according to the IPCC AR4. In the lead-up to Copenhagen, important proposals for limiting emissions by 2020 include (i) the EU's target of limiting industrial emissions to 20% below 1990, and 30% below 1990 if other Parties take on comparable obligations; (ii) the Waxman-Markey legislation that is under discussion in the USA, which may lead to a decrease of emissions to about 5% below 1990 (18% below 2005); (iii) Japan's target to limit emissions to 25% below 1990; and (iv) Russia's target to limit reductions to 10 or 15% below 1990. These and other Annex-I proposals ***as of 14 September*** are summarized in Table 1. The total reduction of Annex I as a group amounts to 11 to 18% below 1990, which shows that current Annex-I proposals fall short of the required 25-40% below 1990 to stay below 2°C.

It is worth noting that some Annex I Parties proposals include LULUCF emissions whilst others don't. Also, LULUCF emissions of some Annex I Parties are a considerable proportion of their total emissions. This is the case for Canada, for example, where the LULUCF emissions amount to 20% of its total emissions, as opposed to less than 1% for the United Kingdom. If Canada's emission target of 20% below 2006 by 2020 is interpreted as including the LULUCF sector, this translates into an ***increase*** of 24% relative to 1990. Conversely, if this target is interpreted as excluding LULUCF emissions, Canada's target significantly reduces to a 3% ***decrease*** relative to 1990. This discrepancy stems from the fact that LULUCF emissions in Canada have increased at a much higher rate than fossil fuel emissions between 1990 and 2006. In contrast, although Australia's LULUCF sector contributes significantly to its total emissions, LULUCF emissions have decreased since 1990, as opposed to the strong rise in fossil fuel emissions.

Interestingly, recent estimates of mitigation potential in Annex I countries suggest that most current pledges can be met at an approximate net zero cost[11]. In almost all cases, efficiency gains from the measures involved would offset the mitigation investments required. However, the picture is somewhat different if one takes into account the 'cost' associated with the required macro-economic and social adjustments for such a paradigm shift, including changes in lifestyle, but more importantly the shifts between sectors of economic activity, which implies jobs and investments losses.

Table 1 Summary of current Annex I reduction proposals for 2020 as of 14 September 2009.

Annex I Party[12]	Kyoto Target relative to 1990 (%)	Proposed 2020 emission target	Proposed 2020 target relative to 1990[13] (%)
Australia[14]	+8	-5 to -25% from 2000 levels[15]	-2 to -22
Belarus	- 8	-5 to -10% from 1990 levels[16]	-5 to -10
Canada	-6	-20% from 2006 levels[17]	-3
Croatia	-5	As for EU-27 (assume similar)	-20 to -30
EU27	-8	-20 to -30% from 1990 levels[18]	-20 to -30
Iceland	+10	-15% from 1990 levels[16]	-15
Japan[19]	-6	25% reduction from 1990 levels[17]	-25
New Zealand	0	-10 to -20 from 1990 levels[16]	-10 to -20
Norway	+1	-30% from 1990 levels[16]	-30
Russian Federation	0	-10 to -15% from 1990 levels[16]	-10 to -15
Switzerland	-8	-20 to -30% from 1990 levels[16]	-20 to -30
Ukraine	0	-20% from 1990 levels[17]	-20
USA (Kyoto not ratified)	(-7)	-14 to - 18% from 2005 levels[16]	-1 to -5
TOTAL	**-5**	**Aggregate reductions from 1990 levels[20]**	**-11 to -18**
IPCC		**Aggregate reductions from 1990 levels**	**-25 to -40**

To what extent do current pledges help us to stay well below 2°C?

Global warming is virtually certain to exceed 2°C under the current reduction proposals for 2020 and 2050 by both Annex I and non-Annex I Parties (see Figure 7). A commentary by Rogelj et al(2009)[21] published in Nature on 11 June 2009 shows that Annex I countries GHG emissions commitments from industrial sources (i.e. all sources except land-use change and forestry) collectively add up to an overall cut of between 8% and 14% below 1990 levels by 2020. This total reduction is different from the estimate in Table 1 above (-11 to -18%). On the one hand it does not include Party proposals that have been announced since the beginning of June (such as the latest Japanese, Russian and New Zealand proposals). On the other hand, it does include positions on 2050 reductions, as well as proposals by some developing countries, such as increased energy efficiency in China and Brazil, reduced deforestation in Brazil and India's proposal to not exceed the per capita emissions of Annex-I countries, which would limit India's emissions roughly from the 2040s onwards.

According to Rogelj and others (2009), it is also increasingly clear that with the current reduction proposals, the associated growing CO_2 concentration in the atmosphere will threaten the world's oceans owing to acidification. A substantial risk to calcifying organisms arises at atmospheric CO_2 concentrations of 450 ppm, with all the coral reefs halting their growth and beginning to dissolve at a concentration of 550 ppm. The most optimistic emissions pathway under current commitment proposals would result in CO_2 concentrations above this level shortly after 2050.

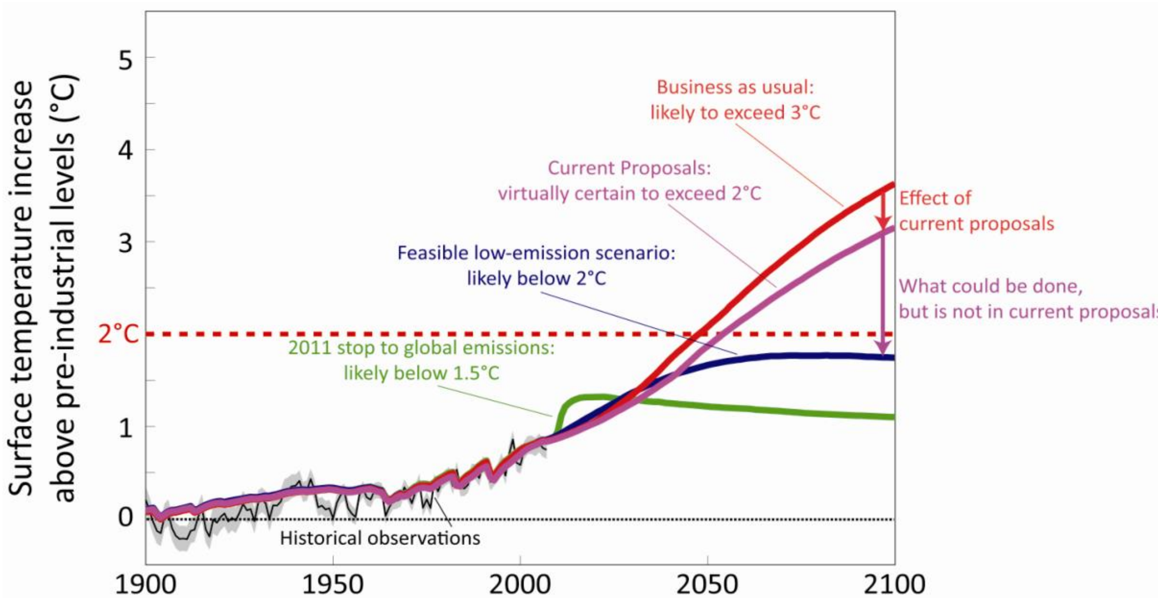


Figure 7: Impact of current Annex-I and non-Annex-I reduction proposals (purple line) for 2020 and 2050 plotted against the no-mitigation (red) and ambitious mitigation (blue) scenarios. For additional explanation, see caption Figure 5.

5. Non-Annex I mitigation equation

In Section 2, we explored the challenges associated with keeping global warming below dangerous levels. We highlighted the imperative for industrialised countries to take the lead in emission reductions, based on their historic responsibilities. We also showed that non-Annex I role in mitigation was paramount. It is worth noting that some developing countries indicated in Bali that they were willing to contribute to emission reductions according to the Nationally Appropriate Mitigation Actions (NAMA) principle, provided they get support from industrialized countries. This section analyses the significance of current non-Annex I proposals, their mitigation potential at net zero cost and concludes by looking at the benefits of clean technologies for African energy and sustainable development.

According to Rogelj and others (2009) the collective commitments of non-Annex I countries would add up to reduction of around 4% below anticipated business as usual (BAU) emissions for 2020, which is significantly below the 15-30% range that, together with reductions of Annex I emissions of 25-40% below 1990 by 2020, is required to keep global warming below 2°C[22.]

A recent report by Bakker et al (2009)[23] estimates non-Annex I countries mitigation potential at net zero cost between 4 to 5 Gt CO_2-eq/year by 2020. This is comparable to the currently proposed Annex I reductions and would bring non-Annex I emissions to roughly 15% below BAU. However, net zero costs mean that a large part of the potential lies in negative cost measures, for example increasing energy efficiency at net economic benefit. The potential for such negative cost mitigation measures predominantly reside in non-Annex I countries with a large industrial sector. Consequently, the LDCs' emissions reduction potential at net zero cost is much lower because the negative cost potential is negligible.

Reducing emissions to this extent will require massive changes to the world's carbon-based economy and the current inefficient use of energy. The good news is that many of the required technologies, such as geothermal, solar and wind power already exist, and there are many opportunities to improve and expand on their use.

Specifically, what's in it for Africa?

Africa's right to development cannot be overemphasized and economic growth is a powerful instrument for reducing poverty and improving the quality of life in developing countries. There is a two-way relationship between climate change and economic growth. Climate change impacts slow down a country's growth prospects as resources are diverted to respond to climate-induced shocks. Economic growth is in turn historically associated with the rise in GHG emissions which is driving climate change. Africa, particularly sub-Saharan Africa, needs more energy for its development.

According to Bokko et al (2007)[24] access to energy is severely constrained in this part of the world with an estimated 51% of urban populations and only about 8% of rural populations having access to electricity. Extreme poverty and the lack of access to alternative sources of energy mean that 80% of the overall African population relies primarily on biomass to meet its residential needs, with this fuel source supplying more than 80% of the energy consumed in sub-Saharan Africa. For example, in Kenya, Tanzania, Mozambique and Zambia, nearly all rural households use wood for cooking and over 90% of urban households use charcoal. Dependence on biomass can promote the removal of vegetation. Figure 8 (below) shows that Africa's ability to produce more goods and services for each unit of CO_2 equivalent emitted is very low compared to most other developing and developed countries, despite its low share of GHG emissions. This suggests the over-reliance on outdated, carbon-intensive technology as well inefficient use of energy for production. The absence of efficient and affordable energy services can also result in a number of other impacts including health impacts associated with the carrying of fuelwood, and other hazards such as informal settlement fires. Further challenges from rapid urbanization, rising energy demands and volatile oil prices further compound energy security issues in Africa.

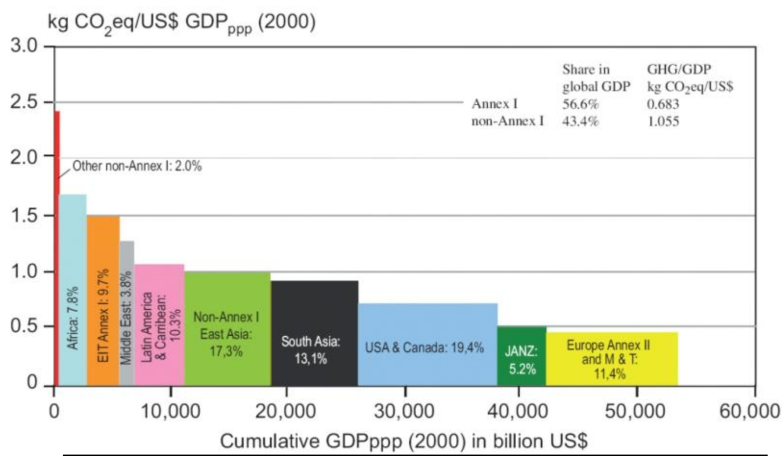


Figure 8: Year 2004 distribution of regional GHG emissions (all Kyoto gases, including those from land-use) per US$ of GDPppp over the GDPppp of different country groupings. The percentages in the bars indicate a region's share in global GHG emissions.
Source: IPCC AR4 WG3 Summary for Policy Makers

This is where Africa can really benefit from NAMAs by tapping into existing clean technologies for its energy requirements and sustainable development. The mitigation challenge for most of Africa is not about ***reducing*** emissions. Rather, it is about ***avoiding*** to follow the carbon-intensive development pathway of the industrialized countries in order reduce GHG emissions later; put differently, the challenge is about developing in a more sustainable manner from the outset.

The new Renewable Energy policy Network for the 21st century (REN21) Global Status report[25] portrays strong global trends for renewable energies. The report reveals tremendous growth and penetration of renewable energies into global markets with global capacity reaching 280,000 megawatts (MW) in 2008. According to the report, developing countries, including some from Africa, have contributed to this growth through for example adopting capacity targets and supportive policies for renewable energies.

Africa has a huge renewable energy potential ranging from large quantities of solar radiation to wind power potential[26]. The continent has an abundance of biomass that can be converted into power; generate fertiliser as well as process heat to drive cold-chain infrastructure or other applications.

According to Africa Progress Panel (APP) and UNEP (2009)[27], examples of other renewable energy potential on the continent include:

Wind power: Some 300 MW of wind turbines are currently being installed in northern Kenya. In Ghana, it is estimated that there is 100km^2 of potential windy areas already within 25km of roads and transmission lines and outside protected areas, and 500MW of turbines could be installed providing 10% of the country's electricity. This could provide lighting and refrigeration for about 500,000 Ghanaians' homes. By co-financing wind power projects in Africa, developed countries would help lower GHG emissions and provide indirect support to turbine manufacturers and engineering service providers who tend to be based in Europe.

Solar power: North Africa, the Sahel, and parts of Southern Africa have substantial potential for solar thermal power. The EU Mediterranean green power initiative plans to launch two solar thermal power plants with at least 50MW capacity each in the Sahel over the next four years to demonstrate the feasibility of this technology in Africa and lay the foundation for large-scale replication. According to some estimates[28], there is enough solar radiation hitting deserts over an area of 800 km by 800 km to power the entire planet. Harnessing just a fraction of this could generate a whole new economy

Geothermal power: The Great Rift Valley, which runs through Rwanda and as far north as Yemen, along with other young geological formations in Africa has potentially 7,000MW of untapped energy, waiting to be harnessed.

De Gouvello et al (2008)[29] have demonstrated that the potential for clean energy projects in Sub-Saharan Africa is large. In this context, innovative, climate change–related financial instruments offer an unprecedented opportunity to explore this overlooked potential for the socioeconomic benefit of countries across the region. As currently discussed in many developed nations, local and regional tapping of renewable energy sources will reduce a country's dependency on fossil-fuel producers and international markets, thereby increasing national energy security. This goal can be achieved via appropriate coordination of the new climate change financing mechanism with conventional energy sector–based support provided by development assistance. An illustration of such required coordination is the need to fill regulatory gaps in the region's energy sectors, which prevent implementation of clean energy projects. De Gouvello et al (2008) state that "without appropriate coordination between climate-change and conventional-development aid, economies in Sub-Saharan Africa will be further hindered, or even prevented, from receiving their share of the carbon revenues that already flow to the world's other developing regions".

De Gouvello et al (2008) estimate the financing required to implement some 2,755 potential clean energy projects for which preliminary costing could be done is estimated at about USD158 billion. If the capital cost of projects related to large flared, associated-gas recovery could be calculated, this figure would likely exceed USD200 billion. De Gouvello et al (2008) assert that "while this figure may be perceived as large, in the context of global climate change, it represents only a small fraction of recently estimated amounts required for industrialised countries to shift from conventional to cleaner energy over the next several decades." Investment in small-scale renewable power plants and to set up the facilities that can replicate these projects on a large scale should be enabled by adequate financing stemming out the Copenhagen deal.

There are also jobs to consider. An estimated 12 million could be employed in biomass and biomass related industries alone[27]. Long-term growth and stability of the renewable energy sector can only be safeguarded if it taps into the enormous potential of developing countries. If financing was made available and such projects were launched, this would contribute to international effort to boost global demand in response to the prevailing financial crisis. Africa would have killed two birds with one stone: it would have been part of a solution to problems created by others.

An effective response to climate change for Africa would therefore focus on adaptation as well as mobilising financing and technology transfer to seize mitigation opportunities that can achieve a "win-win" solution by promoting low-carbon technologies and advancing development aims. It is clearly in Africa's interest to ensure an ambitious mid-term (2020) emission reduction targets for industrialized countries are a critical prerequisite. According to a joint press statement released by AOSIS and the group of LDCs on 14 August 2009, they joined forces in demanding that the new Copenhagen climate agreement limit temperature increases to as far below 1.5°C as possible. The 80 countries that make up the AOSIS and the Group of LDCs are now united in calling for industrialized countries to collectively reduce their GHG emissions by at least 45% below 1990 levels by 2020. They demanded that global emissions peak by 2015, and fall quickly thereafter to ensure that total global emissions are reduced to at least 85 per cent below 1990 levels by 2050. This, coupled with carbon capture and storage, would make it possible to return atmospheric GHG concentrations to below 350 ppm of CO2 equivalent. The more emissions developed economies have to cut, the more scope for Clean Development Mechanisms (CDM) projects and the higher the price of carbon and thus financial flows. Alongside this, clarity on a long-term (2050) global goal for emission reductions must be ensured.

APP and UNEP (2009) argue that the needs and responsibilities of, for example, Chad and China differ substantially as far as the science and economics of climate change are concerned. Africa needs the support of its G77 partners to ensure the special needs and unique position of the LDCs are articulated, incorporated and protected. Their position must not, however, distract from the imperative of the developed countries to take on stringent and binding emission reduction targets and to strengthen international mechanisms on financing, technology transfer and capacity building to help meet the adaptation and mitigation needs of the developing countries.

6. Conclusion: seizing the historic Copenhagen opportunity

Tibb (1998)[30] listed the major global problems that could lead to a crisis pitch: global climate change, food and water shortages, proliferation of weapons of mass destruction, genetic depletion and damage, antibiotic-resistant epidemics, social inequity and injustice, energy shortfalls, economic depression, chemical pollution, and ecosystem failure. These problems, he said, are not isolated "many have common root causes, and they tend to amplify each other. Under adverse circumstances they could all reinforce to create one mega-crisis, a crisis of crises. This is the downside scenario, and it is easy to become mesmerized by the apparent inevitability of the slide into chaos. This is why it is important to understand the positive changes that are needed to prevent a global crisis, to fully appreciate the nature of the upside scenario. If we clearly see the risk, and if we understand what is needed to avoid it, we stand a chance of acting with constructive foresight". The previous sections of this paper have dwelt on the risk of climate change and what needs to be avoided. The remaining part of the paper will focus on developing a constructive foresight.

According to the declaration by the Swedish government's Commission on Climate Change and Development[31], climate change "presents humankind with a historic opportunity to make development more sustainable, encompassing a low carbon and addressing the risks posed by climate change. It offers an opportunity to create trust and cooperation to better manage all crises, to fashion a market built on ecological truths as well as economic data, to redefine the way we measure growth and prosperity. It provides an opportunity for developing renewable energy for growth, providing the vulnerable with resources for adaptive capacity, and reducing the risk of disaster. The responses to climate change provide an opportunity to address the inherent inequity in the climate process and to create equity within nations, among nations and between nations".

The declaration further reads: "the way nations responded to global recession can provide the basis for a new path of development that begins to ease the planet's interlocked emergencies". The authors of the statement regret that "the international community seems less concerned about the failing climate system than about the failing financial institutions. It hesitates to speak of millions for adaption to climate change but mobilises billions for the financial crisis. Faced with a global crisis, nations risk turning inward, focusing on narrow concerns, which would be a historic mistake."

How can Africa make best use of this historical opportunity to ensure an effective, fair and inclusive regime in Copenhagen?

Firstly, Africa should ensure the climate discussions focus on the need to keep global average temperature rise below 1.5°C, compared to pre-industrial levels, to avert catastrophic climate change. This requires global emission to peak before 2020 and to decline rapidly to far below 50% of 1990 levels by 2050. In particular, developed countries must commit to aggressive binding emission reduction targets of at least 45% by 2020 and at least 85 by 2050, all from 1990 levels.

Secondly, a deal on climate change ultimately requires a deal on development. Africa must position itself to build international competitiveness within the emerging low-carbon global economy. To this end, developed countries should make a strong commitment to support developing countries and Africa in particular to acquire clean technologies and build capacity for its energy requirements, adaptation and sustainable development. This requires new, sustained and predictable financing in the order of at least USD150 billion per year by 2020.

Thirdly, the carbon market must be realigned to take into account the special needs of Africa. Many economies in Africa, where the energy, transport, construction or industrial sectors are in early stages of development, have relatively small mitigation potentials. The new deal must have an architecture that supports appropriate small-scale mitigation projects, simple in structure and finance, but with high contributions to sustainable development.

Fourthly, climate friendly investment flows are important. Africa must act now and create enabling conditions for the leap-frogging of African countries towards a low-carbon economy and society. This should include for example filling the regulatory gaps in the region's energy sectors, so that clean energy projects can be implemented.

Fifthly, high-level political buy-in and lobbying by African governments is needed now for a set of practical proposals to be adopted in Copenhagen. Many agreements are likely to be struck bilaterally between developed countries and large developing countries. Africa and the LDCs risk being sidelined in these negotiations. African leaders can use their influence to draw the world's attention to their special needs and precarious position. In particular, African governments will need to ensure that the G77 and China position reflects the special needs of LDCs. The high-level meetings scheduled for the second half of 2009 provide ideal opportunities to generate maximum buy-in from other countries for such a position. Success will necessitate a major effort that needs to be sustained over the remaining months to Copenhagen. The need for African leadership with practical ideas cannot be over-emphasised.

Sixthly, Africa should proactively invest in building coalitions of like-minded groups and articulate more cohesive positions. The LDCs and AOSIS make up 75% of the G77 membership. For example, their collaboration could take the form of sharing intelligence, technical and analytical advice. Working collaboratively with other vulnerable countries would enhance their collective impact on negotiations. It would help de-mystify some of the most sensitive and complex areas as well as advance global negotiations as a whole.

These recommendations are interconnected and will require further scientific, technical, legal and strategic analytical support. Such analyses would need to be brief, and sometimes be provided on real-time basis. African negotiators need to discuss how these could be provided to ensure they are adequately equipped for the make-or-break Copenhagen agreement.

END NOTES

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[13] 2020 targets based on use of the same emissions accounting assumptions as each Party used in the base year. The aggregate effect of the reduction targets in this column is the change from 1990 levels of the sum of all countries individual set of emissions for the sources and sinks counted in the target.

[14] Data source: Revised inventory referred to in revised Initial report under Article 7, paragraph 4, of the Kyoto Protocol of Australia, National Inventory Submissions 2009 Australia - CRF - 26 May 2009, http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/4771.php accessed on June 8, 2009

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[16] Assumed 2020 target is set with respect to GHG emissions including LULUCF so that reported change is from 1990 including LULUCF inventory for that year to specified year also including reported LULUCF inventory.

[17] Assumed 2020 target is set with respect to GHG emissions excluding LULUCF.

[18] Assumed 2020 target is set with respect to GHG emissions excluding LULUCF as the feasibility of the 20% and 30% targets have been evaluated excluding LUCF.

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